Trends in recent late blight scientific publications

October 2019

Alberto Maurer, PhD
Chief Scientist
CIP-China Center for Asia Pacific (CCCAP)

CIP's Mission is

to work with
partners to achieve
food security,
well-being, and gender equity for
root and tuber smallholders
in the developing world

We do this through
research and innovation
in
science, technology, and capacity strengthening.

CIP
INTERNATIONAL POTATO CENTER
A member of the CGIAR Consortium

1 BILLION PEOPLE
eat potato in more than 140 countries worldwide

World Food Prize is awarded to scientists from the International Potato Center - CIP

Global Presence

23 Country Projects

18 Country Offices

Operations in 23 countries spanning South America, SSA, Asia + China

Lima PERU

45 Anniversary 2016

45 years old
based in Lima, Peru

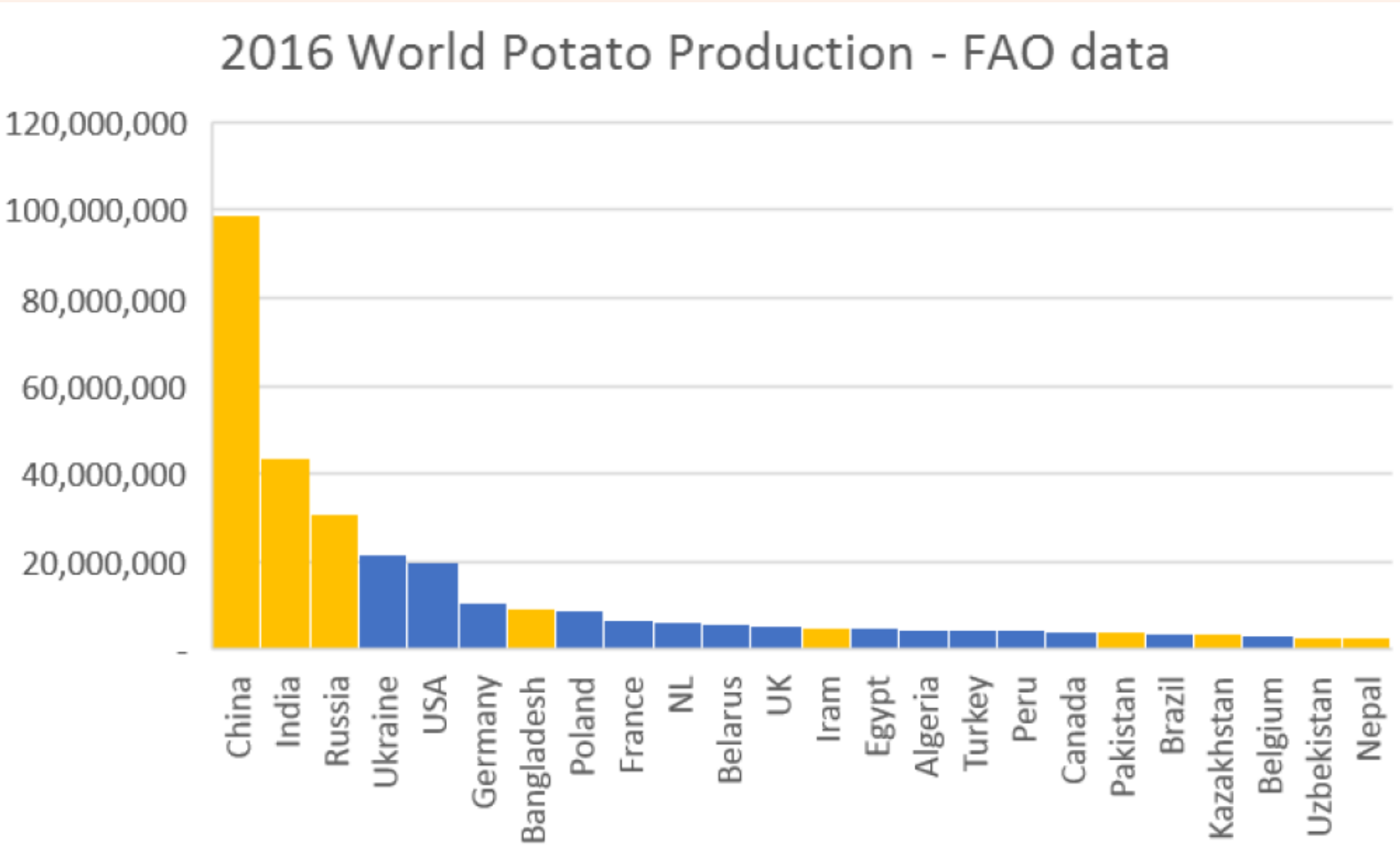
3rd

POTATO
most important crop

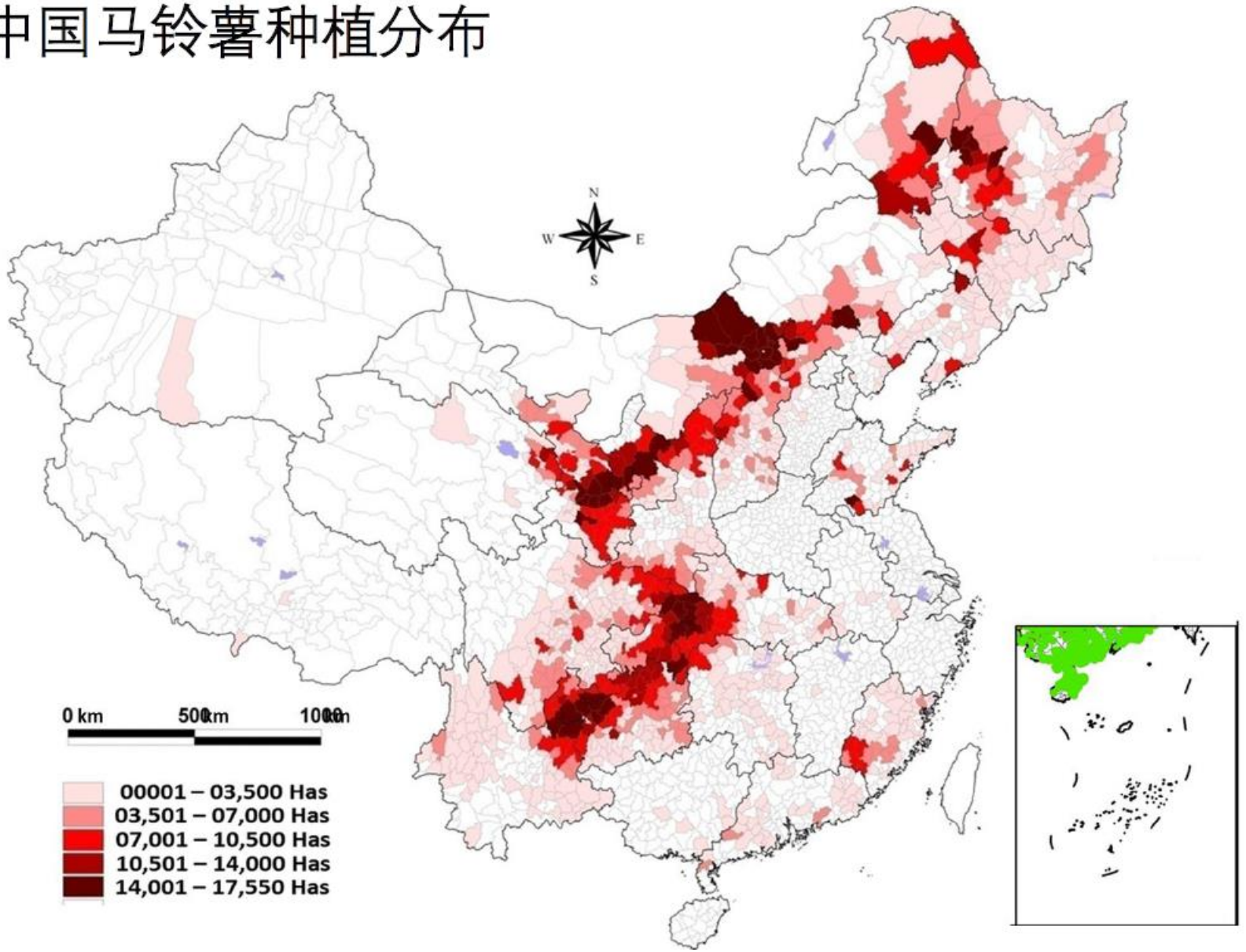
6th

SWEETPOTATO
most important crop world wide

CGIAR
PROGRAMA DE INVESTIGACIÓN SOBRE Raíces, Tubérculos y Banano


2016 World Potato Production - FAO data
120,000,000
100,000,000
80,000,000
60,000,000
40,000,000
20,000,000
-
China
India
Russia
Ukraine
USA
Germany
Bangladesh
Poland
France
NL
Belarus
UK
Iram
Egypt
Algeria
Turkey
Peru
Canada
Pakistan
Brazil
Kazakhstan
Belgium
Uzbekistan
Nepal

中国马铃薯种植分布


N
W
E
S
0 km
500km
1000km
00001 – 03,500 Has
03,501 – 07,000 Has
07,001 – 10,500 Has
10,501 – 14,000 Has
14,001 – 17,550 Has

Survey: Global Research Priorities for Potato

Breeding goal	Priority Top 12	Priority Global	Priority ESEA	Priority SWCA
Drought tolerance	1	2	2	1
LB resistance	2	1	1	-.-
Improved nutritional quality	3	-.-	-.-	-.-
Resistance to soil diseases	4	-.-	-.-	-.-
Improved cropping systems	5	6	-.-	-.-
Earliness	6	3	4	1
Yield	-.-	4	3	4
Improved seed storage	-.-	5	6	5
Virus tolerance/resistance	-.-	-.-	5	1

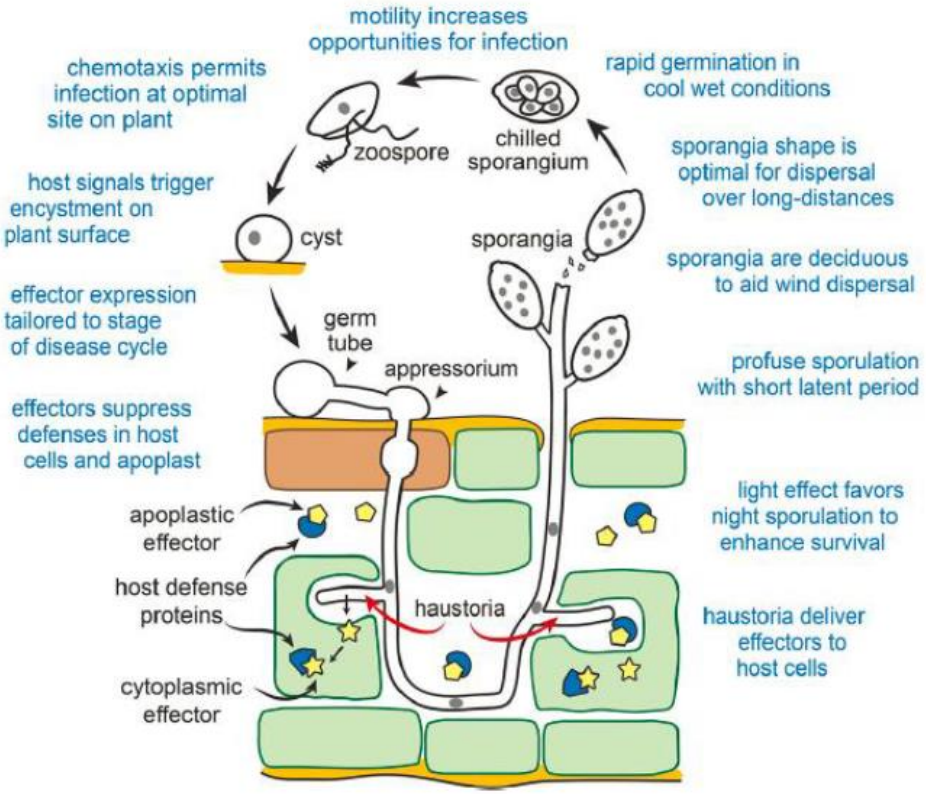
Top 12 = Survey of top 12 potato scientists at CAAS (2018). **Priority Global** = Global survey of 411 scientists and influencers (2014). **ESEA** = East and Southeast Asia (same dataset as the global survey). **SWSC** = Southwest and Central Asia (same dataset as the global survey).

Phytopathology
REVIEW

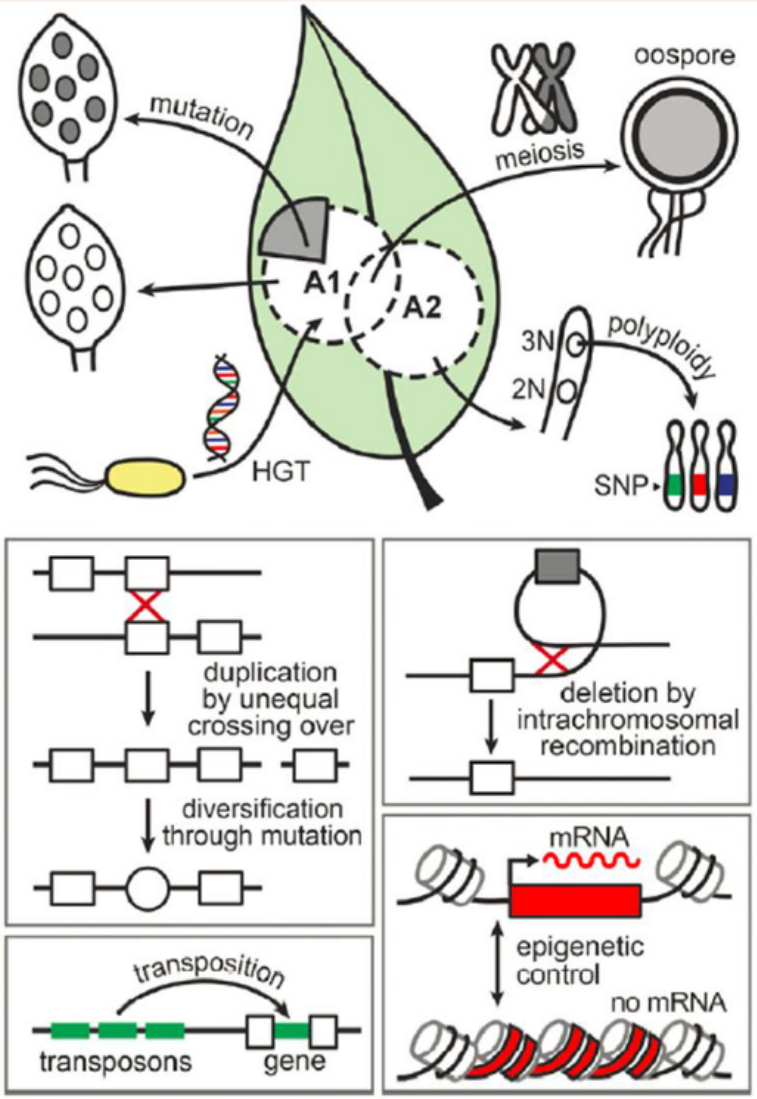
How Does *Phytophthora infestans* Evade Control Efforts? Modern Insight Into the Late Blight Disease

Wiphawee Leesutthiphonchai, Andrea L. Vu, Audrey M. V. Ah-Fong, and Howard S. Judelson†

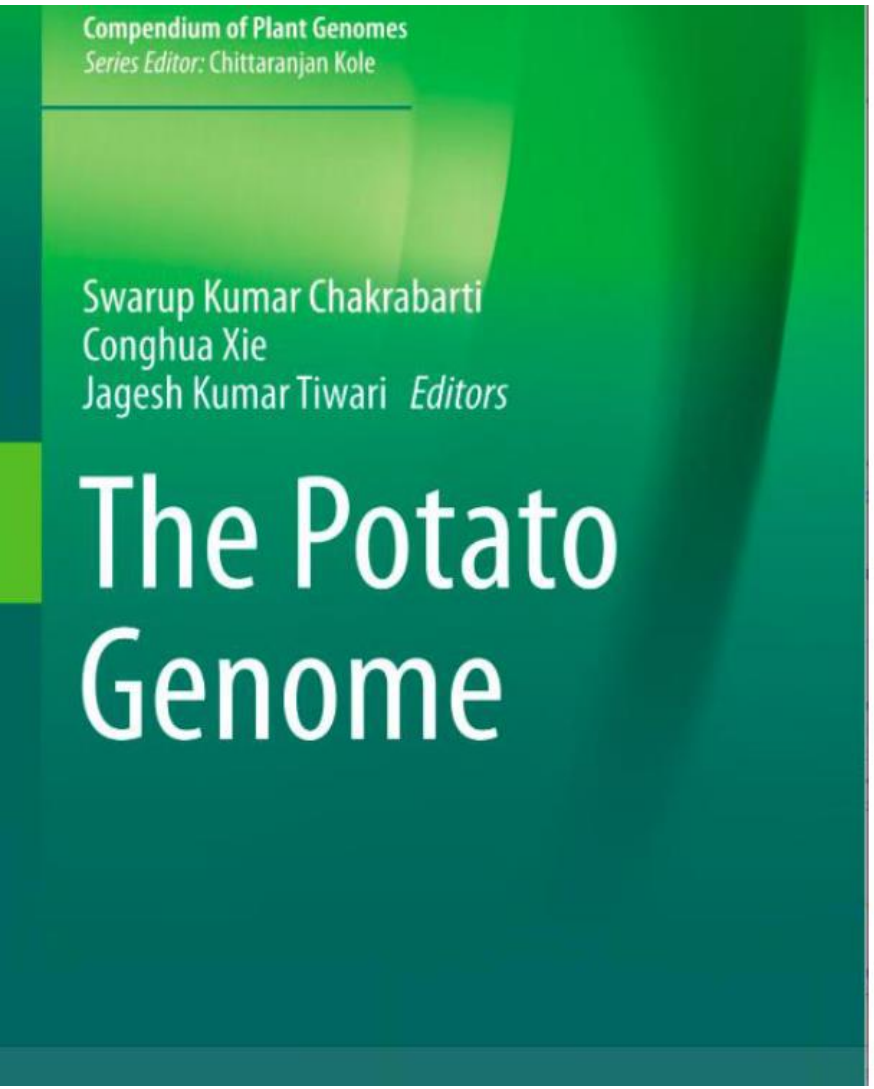
Department of Microbiology and Plant Pathology, University of California, Riverside 92521.
Accepted for publication 19 May 2018.



- Sporulation is timed to optimize disease spread
- Zoospores are potent propagules
- Inocculum
  - Importation of seed
  - Oospores are a multi-year threat
  - Alternate hosts as refugees
- Evading and suppressing Host defense
  - Apoplastic effectors block plant enzymes
  - Apoplastic growth helps evade plant perception
  - Supression by cytoplasmic effectors
  - Orchestrated deployment of the effector arsenal



- Evading chemical control
  - Protective mechanisms
  - Variation in baseline sensitivity
  - Target site mutations
- Mechanisms and benefits of genetic variation
  - Phenotypic diversity
  - Genome architecture encourages variation
  - Horizontal gene transfer has contributed to fitness
  - Gene families enable diversification
  - Polyploidy is common
  - Epigenetic variation



New Strategies Towards Durable Late Blight Resistance in Potato

Juan Du and Vivianne G. A. A. Vleeshouwers

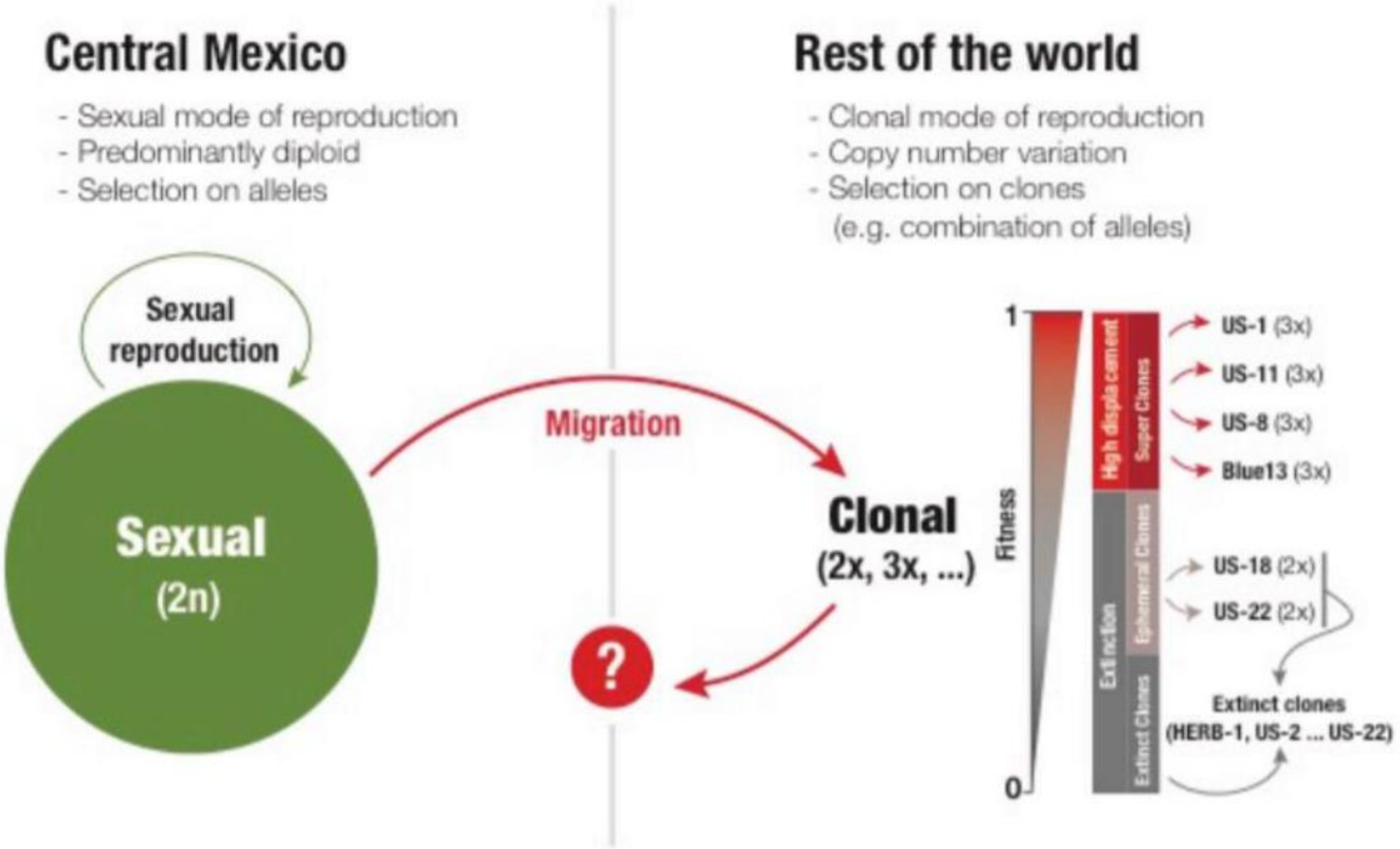
- Exploit Cytoplasmic NLR Genes for Resistance Breeding
- Exploit Apoplastic PRRs for Resistance Breeding
- Effectoromics Assists in Resistance Breeding
- Exploit Key Defense-Responsive Genes for Resistance Breeding
- The Elucidation of the Reference Potato Genome Accelerates the Identification of Resistance Genes

New Results

Genome-wide increased copy number is associated with emergence of super-fit clones of the Irish potato famine pathogen *Phytophthora infestans*

Brian J. Knaus, Javier F. Tabima, Shankar K. Shakya, Howard S. Judelson, Niklaus J. Grünwald

doi: https://doi.org/10.1101/633701


Central Mexico
- Sexual mode of reproduction
- Predominantly diploid
- Selection on alleles
Rest of the world
- Clonal mode of reproduction
- Copy number variation
- Selection on clones
(e.g. combination of alleles)
Sexual reproduction
Sexual
(2n)
Migration
Clonal
(2x, 3x, ...)
?
1
Fitness
0
High display cement
Super Clones
Extinction
Ephemeral Clones
Extinct Clones
US-1 (3x)
US-11 (3x)
US-8 (3x)
Blue13 (3x)
US-18 (2x)
US-22 (2x)
Extinct clones
(HERB-1, US-2 ... US-22)

PLOS ONE

PUBLISH ABOUT BROWSE

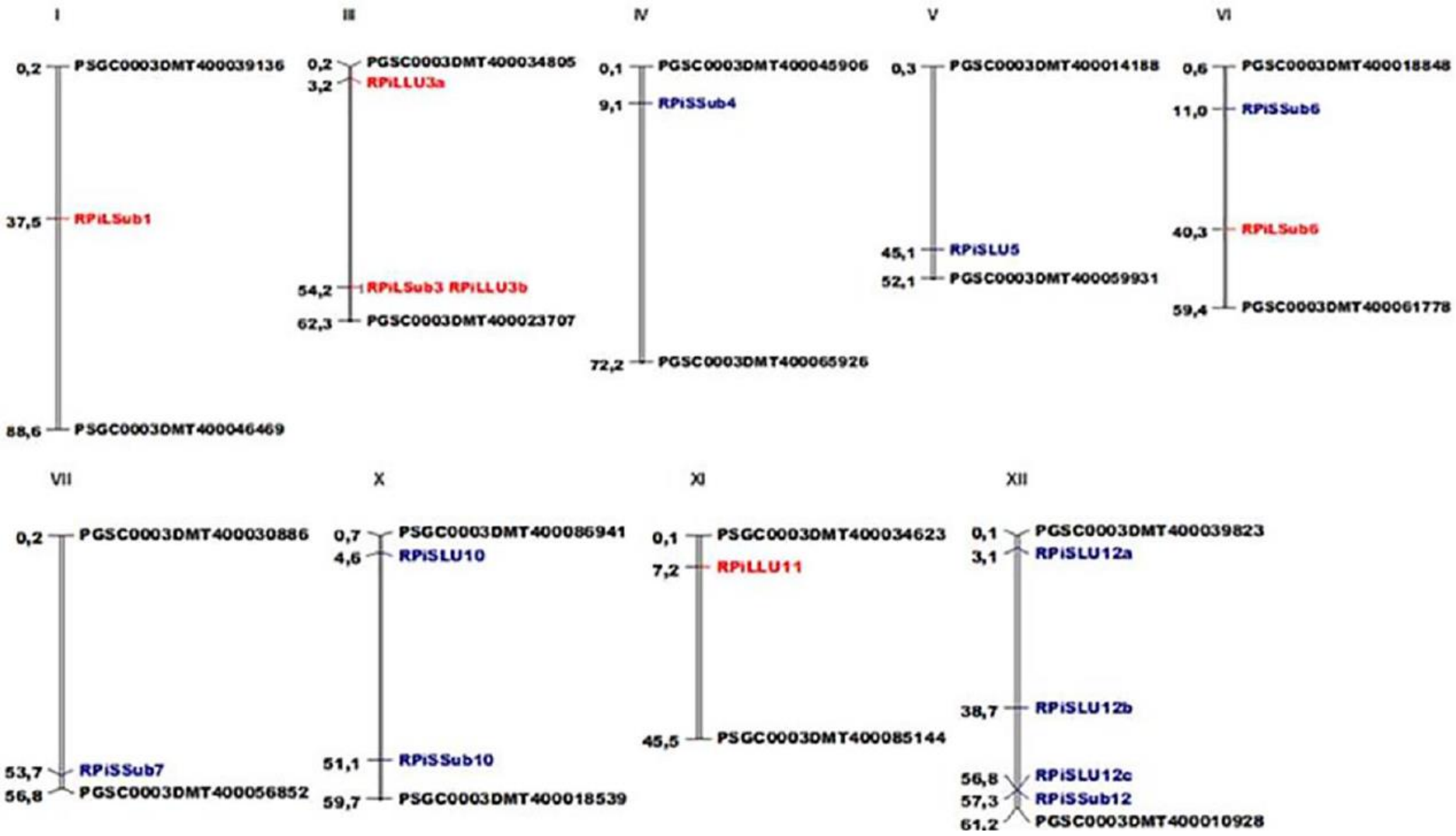
OPEN ACCESS PEER-REVIEWED

RESEARCH ARTICLE

Novel organ-specific genetic factors for quantitative resistance to late blight in potato

Deissy Katherine Juyo Rojas, Johana Carolina Soto Sedano, Agim Ballvora, Jens Léon, Teresa Mosquera Vásquez

Published: July 16, 2019 • https://doi.org/10.1371/journal.pone.0213818 • >> See the preprint


I
0,2 PSGC0003DMT400039136
37,5 RPiLSub1
88,6 PSGC0003DMT400046469
III
0,2 PGSC0003DMT400034805
3,2 RPiLLU3a
54,2 RPiLSub3 RPiLLU3b
62,3 PGSC0003DMT400023707
IV
0,1 PGSC0003DMT400045906
9,1 RPiSSub4
72,2 PGSC0003DMT400065926
V
0,3 PGSC0003DMT400014188
45,1 RPiSLU5
52,1 PGSC0003DMT400059931
VI
0,6 PGSC0003DMT400018848
11,0 RPiSSub6
40,3 RPiLSub6
59,4 PGSC0003DMT400061778
VII
0,2 PGSC0003DMT400030886
53,7 RPiSSub7
56,8 PGSC0003DMT400056852
X
0,7 PSGC0003DMT400086941
4,6 RPiSLU10
51,1 RPiSSub10
59,7 PSGC0003DMT400018539
XI
0,1 PSGC0003DMT400034623
7,2 RPiLLU11
45,5 PSGC0003DMT400085144
XII
0,1 PGSC0003DMT400039823
3,1 RPiSLU12a
38,7 RPiSLU12b
56,8 RPiSLU12c
57,3 RPiSSub12
61,2 PGSC0003DMT400010928

SCIENTIFIC REPORTS

OPEN

Diverse mechanisms shape the evolution of virulence factors in the potato late blight pathogen *Phytophthora infestans* sampled from China

Received: 15 February 2016
Accepted: 27 April 2016
Published: 19 May 2016

E-Jiao Wu[1,*], Li-Na Yang[1,*], Wen Zhu[1], Xiao-Mei Chen[1], Li-Ping Shang[1] & Jiasui Zhan[1,2]


Thanks for your attention!

CIP is a research-for-development organization with a focus on potato, sweetpotato and Andean roots and tubers. It delivers innovative science-based solutions to enhance access to affordable nutritious food, foster inclusive sustainable business and employment growth, and drive the climate resilience of root and tuber agri-food systems. Headquartered in Lima, Peru, CIP has a research presence in more than 20 countries in Africa, Asia and Latin America.
www.cipotato.org

CIP is a CGIAR research center

CGIAR is a global research partnership for a food-secure future. Its science is carried out by 15 research centers in close collaboration with hundreds of partners across the globe.
www.cgiar.org

CIP thanks all donors and organizations which globally support its work through their contributions to the CGIAR Trust Fund. https://www.cgiar.org/funders/